Uni Gliding

Vol 35 Number 9 - December 2010

The Official Journal of the Adelaide University Gliding Club Inc.

http://www.augc.on.net

Editorial

The Editor

Hi,

December's here and its nearly time for the Guy-in-the-Red-Suit to deliver than high spec carbon fibre single seater I've been patiently waiting for all year for (and all last year and, come to think about it, all the year before). Clearly I've not been 'good enough'. For those of you that haven't been good but are curious about lift coefficients, Reynolds Numbers and think that a tip profile is something you have on Facebook, we have a treat (or should that be treatise) this month as Anthony explains why those zig-zag bits of tape you sometimes see on glider wings don't always work the way people expect them to.

I look forward to seeing you on field - or at the Christmas Party (& don't forget to drive carefully).

Regards
Mr. Ed.

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GQZ Photo - Anthony Smith
Calendar Photo - Anne Philcox.

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Notice to all Club Libelle (GMI) Pilots

The seat recline mechanism has a spring to ensure that the seat remains positively locked in a fixed position. You must ensure that the seat is locked in place, preferrably with material behind the seat to ensure it does not recline during a winch launch. It is thought that backward movement of the seat has contributed to serious accidents on winch launch for this type of aircraft.

Uni Gliding

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Does a Bergfalke IV Need Turbulators?

Anthony Smith

AUGC Instructor Anthony Smith gets out the aerodynmics theory book, fires up his portable wind tunnel and attempts to answer a question that has consumed mankind down through the ages "Does the Bergfalke 4 need turbulators?".

It all started out innocently enough. GZQ is having a 10 yearly survey combined with a major refurbishment and we needed to make jigs to support the wings. We knew the root airfoil profile and the wing tip airfoil profile, but we want to support the wing at the rib at the inboard end of the aileron as recommended by the manual.

Turbulator strips come in a variety of sizes...

Typically a glider wing will change its profile as a function of it's chord length. Because the Bergfalke has a modest taper inboard of the ailerons followed by an increased taper from the ailerons to the tip, it would be expected that the profile would be mostly the root profile out to the inboard end of the ailerons followed by a rapid change to the tip profile. This makes a bit of sense as the airfoil would be designed with a certain Reynolds Number range in mind, and the Reynolds Number is heavily influenced by the chord of the wing.

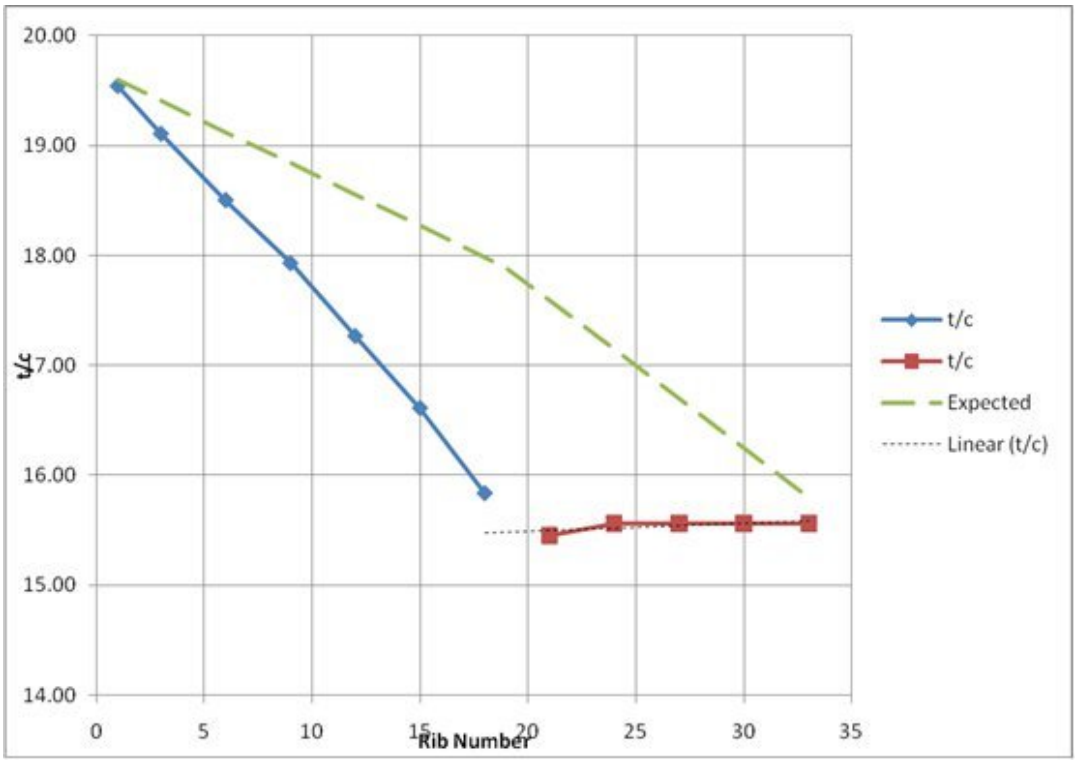
Reynolds Numbers are a way of describing fluid flow states and it is effectively a ratio of fluid inertia to fluid viscosity. In gliding airfoil terms, lower Reynolds Numbers (short wing tips) tend to have an excess of laminar flow and the airflow will run into separation problems if you try to slow it down quickly. Higher Reynolds Numbers (long wing roots) means that the airflow has a better chance to transition to turbulent flow before slowing down. Designers tend to compensate for Reynolds Numbers in the airfoil designs by making low Reynolds Number airfoils thinner, so that the air is not going as fast over the surfaces, and with the peak thickness (and hence peak air speeds) more towards the nose of the airfoil so that there is a longer distance at the rear to slow the air down. The slower peak speed and the longer deceleration distance means that the deceleration is less severe and separation bubbles may be avoided or at least not as severe.

Laminar separation bubbles are a bug bear of glider design. Laminar airflow will only tolerate a very slow deceleration rate. If you try to slow it down too fast, it will no longer follow

Does a Bergfalke IV Need Turbulators? (Cont.)

the curvature of the wing (ie it will separate from the surface). The act of separating however will trigger the airflow to transition to turbulent flow. Turbulent flow can withstand greater deceleration rates and will start to follow the surface of the wing again. The effect is a pocket of air trapped against the surface of the wing underneath the area where the laminar flow has separated. The pocket of air is a laminar separation bubble and it is dragged along with the wing. These bubbles will vary in size, but can cause a lot of drag. The solution is to cause the airflow to transition to turbulent flow before a bubble is formed – turbulator tape.

The Bergfalke wing spar is straight and runs roughly along the wing where the maximum thickness of the airfoil is. The root profile is quite thick: the max thickness is 19.6% of the chord length. The tip profile is more modest, but still chunky by more modern standards, at 15.8% of the chord length. Using the wing spar drawing dimensions from Scheibe and by measuring the chord of GZQs wing at various ribs, I came up with the following:



Bergfalke thickness to chord (t/c) ratio across the span

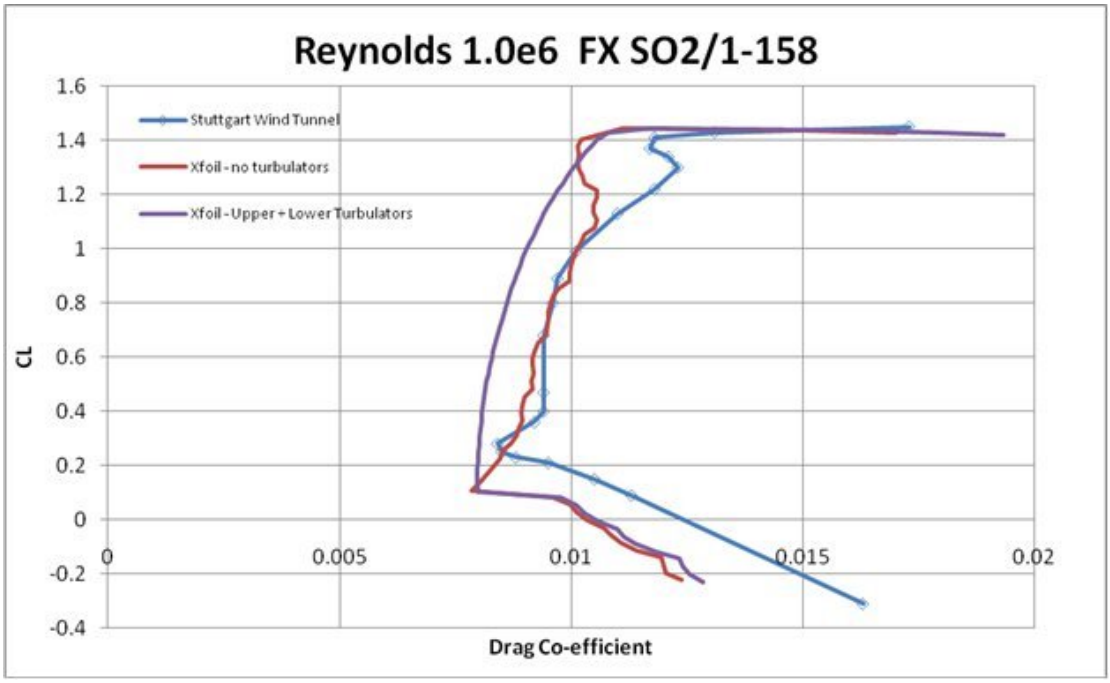
This came as quite a surprise as it was almost the opposite of what is taught in the text books where the t/c is proportional to the chord length. The Bergfalke wing rapidly changes from the

Does a Bergfalke IV Need Turbulators? (Cont.)

root profile to the tip profile by the inboard end of the aileron and is then the tip profile all the way out.

Some quick calculations and a peak in the Stuttgart Profile Catalogue (wind tunnel test results of many Wortmann airfoils) lead to another surprise – the wingtip airfoil showed signs of separation bubbles in the wind tunnel tests.

The next step was to try and test the airfoils in a software wind tunnel. Testing airfoils is a difficult process whichever way you do it. Software models make approximations and have difficulty predicting the strength of separation bubbles. Wind tunnels often use scaled airfoils much smaller than real life which makes the models very sensitive to inaccuracies during fabrication, particularly in the 1960's when they were probably made by hand. These days the models are all laser cut by computer. Getting the computer results to line up with wind tunnel results is something of a miracle.



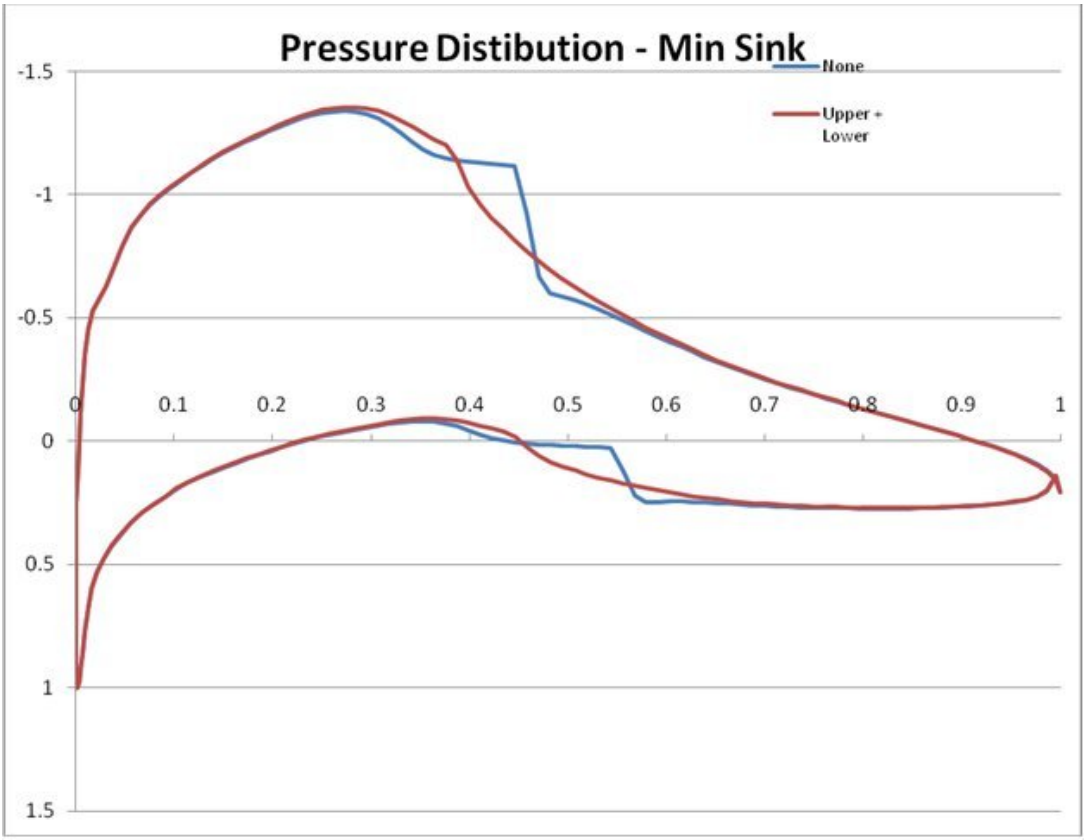
Below is a chart comparing the Stuttgart wind tunnel results and the software results. A Reynolds Number of 1 x 106 is roughly the wingtip at 52 knots at sea level.

The software predicts the maximum lift quite well. It also predicts the drag over the working region for a CL of 0.2 to 0.8 (roughly from 90 kts to min sink speed). Things go astray near the stall and down the bottom of the drag curve and it is not immediately apparent why.

Does a Bergfalke IV Need Turbulators? (Cont.)

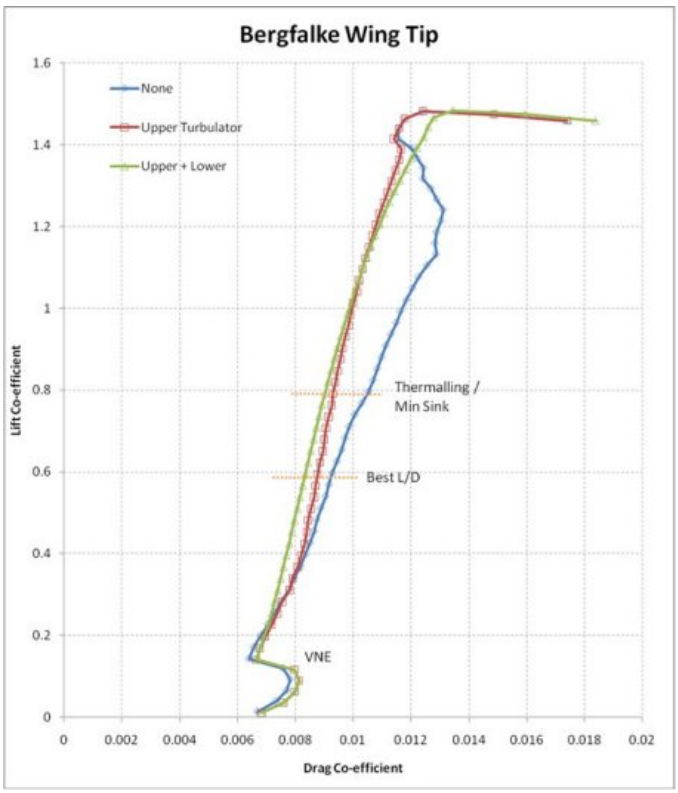
It can be seen that a big improvement can be made by adding a turbulators so that the flow is turbulent on the upper surface by 38% of the chord and on the lower surface by 44% of the chord. This achieves an approximate 10% reduction in drag at CL = 0.8 (min sink).

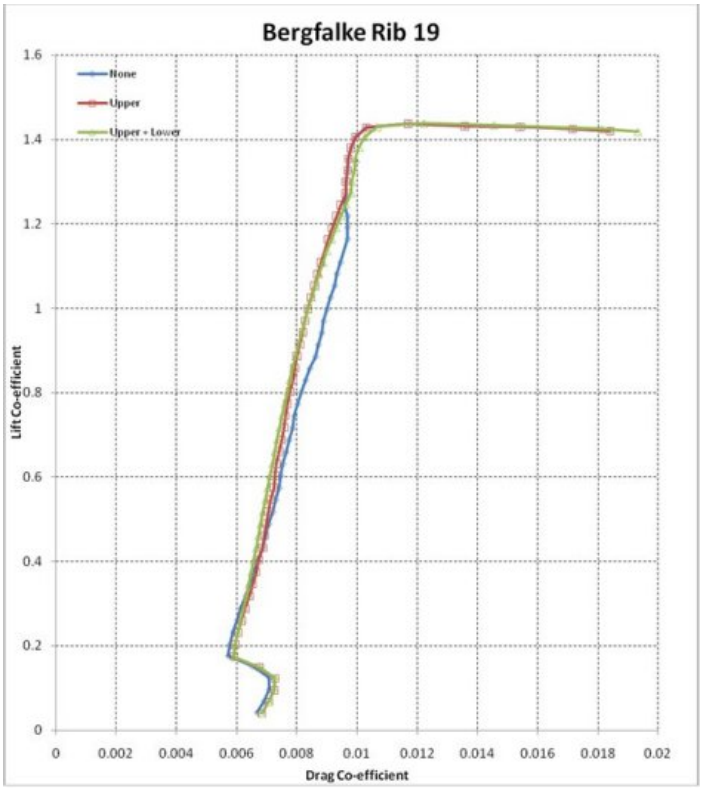
The figure below shows the pressure distribution with and without turbulators.



Except all of the above is done at one speed and the angle of attach varied. In real life the aircraft's speed varies with angle of attack. The figures on the next page are two charts that vary the speed (and hence varies the Reynolds Number) with the Angle of Attack for both the wing tip and the section at rib 19.

Does a Bergfalke IV Need Turbulators? (Cont.)





As can be seen, the improvement from the turbulator tape is reduced by the longer chord further inboard on the wing. The turbulator at rib 19 was improved by moving the upper turbulator aft slightly so that turbulent flow was at 40% of the chord.

So what affect does this have on the glider performance?

The problem is that the wing profile drag is not the only source of drag on the glider, there is drag from the profile of the fuselage and tail and induced drag as well. The table below shows the improvement in performance for both upper and lower turbulators on the outboard end of the wing (rib 19 outwards).

	CL	Tip Improvement	Rib 19 Improvement	Ave	% of Wing Area	Approx Drag Due to Wing	Performance Improvement
Min Sink	0.8	14.2%	5.5%	9.9%	35%	32.0%	1.10%
Best L/D	0.6	11.0%	4.7%	7.9%	35%	36.0%	0.99%
90 kts	0.2	-1.7%	-2.9%	-2.3%	35%	55.0%	-0.44%

Upper and Lower Turbulators

Obviously it is shown that despite great improvement at the wing tip, the overall improvement is limited for a lot of time

Does a Bergfalke IV Need Turbulators? (Cont.)

and effort. Note that there is a decrease in performance at high speeds! The table below shows the improvement in performance for only lower turbulators on the outboard end of the wing.

	CL	Tip Improvement	Rib 19 Improvement	Ave	% of Wing area	Approx Drag Due to Wing	Performance Improvement
Min Sink	0.8	3.0%	1.5%	2.3%	35%	32.0%	0.25%
Best L/D	0.6	4.3%	2.5%	3.4%	35%	36.0%	0.43%
63 kts	0.4	6.4%	3.5%	5.0%	35%	45.9%	0.80%
90 kts	0.2	0.0%	0.0%	0.0%	35%	55.0%	0.00%

Lower Turbulators Only

Having lower turbulators only gives you less of a performance improvement, but you don't have the high speed penalty from the upper surface turbulator tripping the upper boundary layer early at low angles of attack.

In the real world, you wouldn't notice the difference. However, the modelling above was done by a computer and the only way to see if it works or doesn't is to try it out. So GZQ will get turbulators on the lower wing in front of the ailerons in a vain bid to squeeze an extra 1% or so more performance.

GQZ undergoes an extensive survey in Anthony's workshop.

Treasurer's Notes

Hugh Round

Accounts

You should recently have received an email with your account balance. Apologies for the long interval since the last one.. Over the next week, a detailed account statement and flying log should be available. Please check that the details are correct and contact me if you have any queries, accounts@augc.on.net.

In future, statements will be sent out at the middle of each month to make it easier for you to keep track of your account and flying.

While the club is in a good financial possition, it is necessary to keep good cash reserves to cover running expenses and regular accounts will help greatly with cash flow.

Visiting Pilots

Visiting pilots will now be charged 150% club rates for aircraft hire, winching and other flying costs. With the visit next Febuary from a Japanese university group, this is a timely move.

AEF Packages

The cost of AEF packages for students has risen from $50 to $60. This reflects the GFA temporary membership charge for students now being the same as non-concession.

Be aware that the Fire Danger season has commenced!

This means that the fire pit cannot be used until the season ends in April 2011.

For more information see http://www.cfs.sa.gov.au/site/fire_restrictions/fire_danger_season_dates.jsp.

Notes from the Executive Meeting

We will be participating in O'Week next year (last week of February) and are looking for volunteers to help. Please express your interest on augc-people!

Coaching Week at Waikerie is 27 December - 1 January. If you would like to come and either need an aerotow rating or would like a winch to be there, let Cath know ASAP!

Accounts are finally up to date thanks to our Treasurer, Hugh Round. Balances have been emailed out. Please check the pdf documenting your flights over the past two years before contacting the Treasurer with any errors/queries.

The Arrow fuselage is now orange! A big thanks goes to Michael and Cath Conway and all who have put in effort so far.

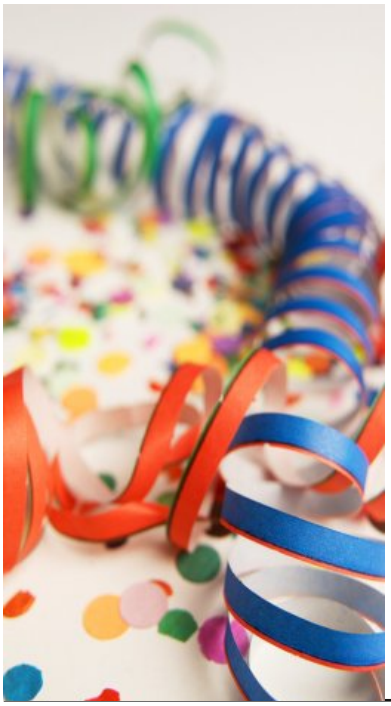
Form 2s on the Puchatek and Motorfalke are essentially complete.

The AUGC Christmas Party is set as Thursday 2nd December at Cath Conway's residence. BYOBB.

Please ensure you drive less than 20km/h within 150m of the church when the wind is blowing in that direction while on the airfield.

Slashing is still required at the 23 and 29 runway ends and just north of the cross strip on 11.

Again, please let Redmond know if you are available to help with the Ryukoku Uni visit during the second week of February next year.



AUGC Christmas Party!

The date is **Thursday 2nd December 2010**.
The venue is **Cathy Conway's residence located at Lot 297 Archer Hill Road, Highland Valley** (If you don't know where this is, Google can help you).
The evening will **kick off from 6:30pm**.
The event is **completely BYO**. BYO meat for the BBQ. BYO salad. BYO drinks. BYO savoury plate to share. BYO self. BYO partner. BYO kids. BYO good weather.

There is access to a pool, so if you do decide to bring good weather then appropriate swimming attire is encouraged.

This event is for all ages and open to anyone in anyway affiliated to the AUGC.

Speed Restrictions on Field

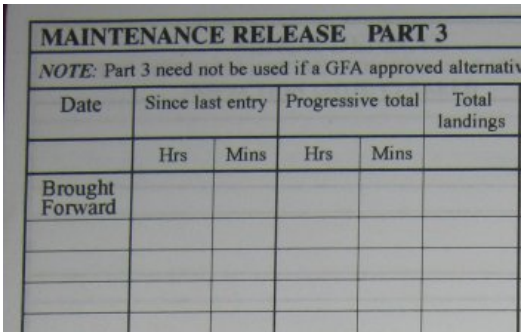
Stonefield is fairly green at the moment but even with all the grass about vehicles moving about the airfield can generate a lot of dust, and this will only get worse as summer comes through. We need to be aware of the impact of this on our neighbours in adjoining properties and mitigate dust as much as possible.

In order to assist with this, there is now a speed restriction of 20 km/hour in place for the airfield South-West (ie Church) corner, within 150m of the house next to the Church.

Coaching Corners

Don't forget the Free Annual Coaching week being held at Waikerie from 27 December 2010 to 1 January 2011. Spaces are strictly limited, send enrollment applications to John Ridge at john.ridge@bordernet.com.au.
The enrollment form can be found at:
http://www.waikerieglidingclub.com.au/coaching/.

Logging Aircraft Flights Reminder



MAINTENANCE RELEASE PART 3

NOTE: Part 3 need not be used if a GFA approved alternati

Date	Since last entry		Progressive total		Total landings
	Hrs	Mins	Hrs	Mins	
Brought Forward					

As the Pukatek and both Single Seaters have noe completed Annual Checks and have brand new DI books its time to remind you that these need to be updated at the end of EVERY day's flying.

It is not good enough to leave it on the assumption that someone flying the next day will do it.

If you fly it - then record it.

Chief Flying Instructor Comments

Dennis Medlow

You need an instructor on field to fly, right? Wrong - independant operations allow for just that, but know the rules and the requirements.

Quite a long time ago (at an airfield not so far away) we always used to need an instructor to fly. Not that any of us on field actually needed the instructor, we were all single seater pilots - but the rules said the instructor had to be present, and so that's how it was. When I obtained my PPL I was happy to find that, once my shiny license was in my hand I could pretty much fly when and where I wanted (subject to a few rules about aircraft ownership, currency, weather and light...).

These days the GFA have issued changes to the Manual of Standard Procedures in order to encourage more flying without the need for an instructor on field - these are called 'independant operations' and its allows a group of pilots with an 'independant operator' (IO) rating, to organise their own flying day/s.

There are 2 type of rating - you wont be surprised to know that they are called 'Independent Operator Level 1' and 'Independent Operator Level 2'. One of the main differences between them is that the Club (AUGC) remains responsible for the actions of a Level 1 IO whereas a Level 2 IO is responsible for their own actions. What this practically means is that a Level 1 IO needs to get Club approval prior to conducting independent operations, generally by getting in contact with the CFI or other instructor and outlining their plans for approval and making sure they understand the need for things like SAR notification.

When operating independently a pilot retains the same priviledges they have when operating under an instructor. That is if the pilot has a AEF or passenger rating, then they can still exercise these priviledges when operating independently.

In order to gain IO status (initially at Level 1) you need to have demonstrated proficiency in a number of areas such as (a) responsible behaviour (b) general skills and airmanship (c) assessing safe operations, (d) understanding operational requirements and (e) accident and incident reporting procedures as well as a thorough knowledge of the AUGC Incident Control Plan. An IO needs to demonstrate a degree of self-organisation and show that s/he can manage all aspects of operating at the

Chief Flying Instructor Comments (Cont.)

airfield. I would also expect that an IO with passenger rating is able to demonstrate safety procedures for visitors to the airfield, including the ability to conduct safety briefings.

It goes without saying that the Club will only grant an IO rating to those pilots that it feels have demonstrated that they no longer require supervision from a more experienced pilot.

The minimum requirements for an IO rating Level 1 are a 'C' badge as well as demonstrated proficiency in the four areas highlighted earlier. The requirements for a Level 2 IO rating are somewhat more exacting including possession of a Silver C badge with 200 command flight hours, GFA radio operator's license and passed oral exams on operating procedures, SAR procedures and airways and operating procedures.

If you feel that you would like to be considered for an IO rating please speak to me or any other instructor, we would be happy to explain what is required in each case and to perform the necessary ground and flight evaluations.

Fly Safe

CFI

Sources: GFA MOSP Section 19 and GFA Ops Directive 4/06.

AUGC on Social Media

Having joined the social media revolution, there is now a Twitter account for @AUGCCFI. Follow it for insightful thoughts 120 characters at a time...

AVIATION AND DRUGS DO NOT MIX

WANTED!

Your photos, articles, observations, musings, news, events, notices, pontifications, ramblings and illustrations.
(Almost) No offer refused.

Contact editor@augc.on.net.

Don't Forget

Update the aircraft flight times and launch numbers in Part 3 of the GFA DI Books at the end of each day's flying.

Diary Dates

Waikerie Performance Week	27 December 2010-1 January 2011
Fire Ban Season	Started 15 November 2010
AUGC Xmas Party	2 December 2010 @ Cathy Conway's
Ryukoku Uni Visit	2nd week Feb 2011
Uni O-Week 2011	21 - 25 February 2011.

Aircraft Maintenance Program

Pukatek (KRO)

Annual Inspection (Form 2) now almost complete. This is being done on field so to reduce the amount of time the aircraft is out of the air we need members' help to get all the work done quickly.

Club Libelle (GMI)

No known issues.

Form 2 due June 2011.

Pik 20D (WVA)

No known issues.

Form 2 due June 2011.

Arrow (GNF)

Aircraft has been moved to Cathy's property outside Mount Barker. Repair work will continue throught the year. There are a number of woodwork repairs to complete - an excellent opportunity to gain skills in wood repair techniques.

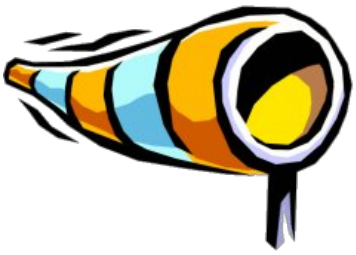
Currently the fuselage is a pretty shade of orange thanks to Michael Conway's spray gun.

MotorFalke (FQW)

Annual Inspection (Form 2) completed on field thanks to Cathy, Derek and Redmond. New ignition cables and throttle cable fitted.

Flarm also needs to be installed.

Airfield Maintenance Program



RWY 23 and associated landing strip has had grass slashed but needs further work.

Things to be done:

- Clad main hanger.
- Layout and walk the cables monthly - it will mean less cable breaks, less delay in launching and a greater chance of catching that awsome thermal.

Clean out the slasher after use, tighten all bolts.

Flying Calendar

December

All dressed up and no-one to fly....

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
		1	2 AUGC XMAS Party!!	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27 Coaching Week Starts	28	29	30	31		

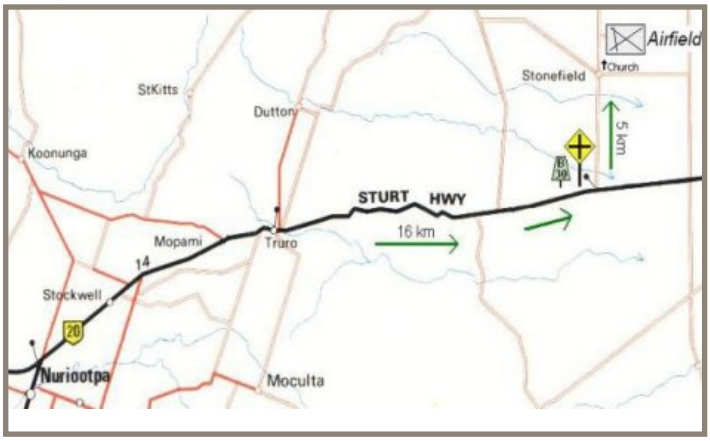
GO FLYING!

Visit http://www.augc.on.net/Calendar.php for the most up-to-date details on Club events.

Stay In Touch

The Club has an email group address, augc-people@lists.internode.on.net, that is used to either discuss or arrange things within the club. If you want to stay in touch with the club, subscribe to the mailing list by filling out the online form at: http://lists.internode.on.net/mailman/listinfo/augc-people.
You can still send an email to the list even if you have not subscribed to it. There is also an 'augc-announce' list for official club announcements, courtesy of our friends at Internode. If you are an AUGC member and have provided your email address then you will already be on this list. If you want to join this list or want to change your subscription, go to:
http://lists.internode.on.net/mailman/listinfo/augc-announce.
You can also get the latest newsletter and up to date news on what is going on at the Club's web page: http://www.augc.on.net. If your email address is on the membership database the Club's Assistant Treasurer can send you your account updates over the internet. Send an email to: accounts@augc.on.net.

Fly This Weekend!



Want to go flying on the weekend? You must ring the club contact person on the **Thursday before between 8.00pm and 10:00pm on 0412 870 963**, (or send an email: contact@augc.on.net) so that he can organise instructors and transport for those intending to fly. Members can book via the online booking system at: www.augc.on.net and go to Gliding > Make a Booking. You can either drive up yourself by following the map at left, or the contact person can arrange a lift to Stonefield either from the Adelaide University footbridge (meet at 7.15am to leave at 7:30am), or from the Caltex Service station on the corner of Montague Road and Main North Road (meet at 7.45am to leave at 8:00 am).

Help out at West Beach!

West Beach is where we carry out the maintenance and repair on our gliders and equipment. There are usually people working down there on Monday and Tuesday evenings most weeks. The entrance is at the end of Foreman St, West Beach.

So you want to help fix the aircraft at West Beach, but can't get there? A lift can be arranged from the Adelaide University footbridge at 7.30pm via augc-people@lists.internode.on.net.

Club Contacts

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